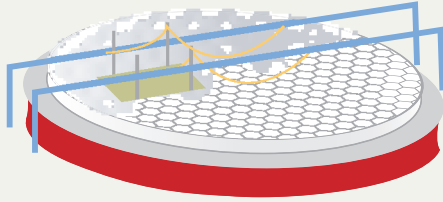


How a telescope mirror is made

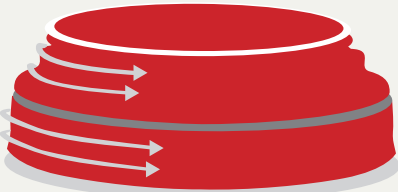
The Giant Magellan is part of a new generation of extremely large telescopes that are under design and development. The \$700 million telescope is planned to be larger and more powerful than any previous optical telescope. The more light such a telescope collects through its system of mirrors, the fainter the objects it can detect. Astronomers hope to take pictures of as-yet-undiscovered planets and, based on the spectrum of colors they give off, determine whether the planets have atmospheres that could favor life. The first mirror for the Giant Magellan is being made at the Steward Observatory Mirror Lab at the University of Arizona.

- 1** The mirror is created by putting blocks of glass into and on top of a large mold containing many six-sided ceramic columns. The mold sits in a furnace tub.



A 27½-foot mirror uses more than 20 tons of glass.

- 2** The tub is then covered and heated to more than 2,000 degrees Fahrenheit and begins to spin. Glass flows into the mold and is then gradually cooled over the next 11 to 12 weeks.

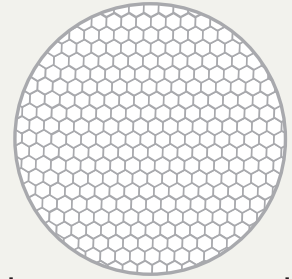


- 3** When the glass is room temperature, workers remove the oven cover and install support, or lifting, discs to the mirror's front surface.

- 4** The support discs enable workers to lift the mirror from the oven using a 45-ton crane. Workers then use high-pressure water to flush out the ceramic columns.

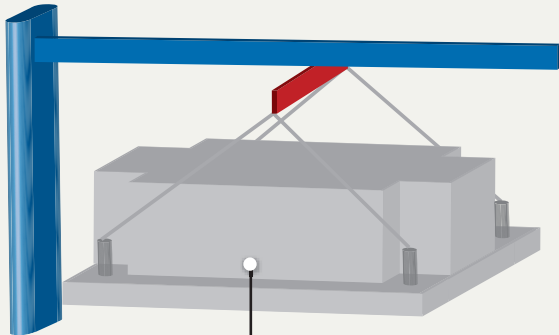


- 5** This creates a honeycomb structure within the mirror structure that makes it lighter, stiffer and more easily controllable in temperature than traditional solid mirrors.



27.61 feet

- 6** Rough grinding begins. A diamond-grinding wheel and then polishing instruments are used to polish both sides. Tests that measure the mirror's surface are carried out periodically to get the front-side finish as smooth as possible. When the mirror is done, the smoothness of the surface varies by no more than a millionth of an inch.



- 7** The mirror is transported by ground or ship (mirrors this large are never flown) to its mountaintop location. Once installed, an aluminum coating is applied to the mirror's surface. More tests are carried out, and the mirror is ready to begin observations. The Giant Magellan will use an unprecedented seven 27½-foot mirrors to collect light and direct it to secondary mirrors, which bring the light to a focus where various instruments can record an image, detect light spectrum or other factors.